



THE 16TH EDITION OF THE INTERNATIONAL CONFERENCE
EUROPEAN INTEGRATION
REALITIES AND PERSPECTIVES

**Arterial Hypertension in Pediatric
Patients during COVID-19 Pandemic**

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Abstract: The current epidemiological context unveils an unprecedented situation as far as arterial hypertension in pediatric patients is concerned, as it has a different impact upon them, mainly because of their individual particularities. During the COVID-19 pandemic, between 01.03.2020-01.03.2021, hospital admissions of pediatric patients having different subjective symptoms associated with high blood pressure levels discovered in the emergency ward have showed variations of this parameter during hospitalization, which was also related to the safety measures imposed nation-wide. This paper presents aspects regarding arterial hypertension in pediatric patients admitted to the cardiology ward of “Sf Ioan” Clinical Emergency Hospital for Children in Galati, over the above mentioned time frame.

Keywords: hypertension; COVID-19; pediatric;

Abbreviations: HTN=hypertension, BP=blood pressure, ARB= angiotension II receptor blocker, ACE=angiotensin converting enzyme

Introduction (Flynn, Kaelber, Baker-Smith & Blowey, 2017, pp. 1-50)

High blood pressure is a clinical entity difficult to diagnose in the pediatric population, which is why it frequently remains underdiagnosed.

Since blood pressure is an easily influenceable parameter, measuring blood pressure in the child involves ensuring adequate environmental conditions, using cuffs appropriate to the patient's size and collaborating with a calm and quiet child.

It is particularly important to identify the pediatric population with elevated blood pressure levels in order to prevent, detect and control the disorders following this pathology.

According to the American Pediatric Association, for children under the age of 13, arterial hypertension is defined as an increase in systolic and diastolic blood pressure above the 95th percentile for age, sex and height, being staged as follows (Flynn, Kaelber, Baker-Smith & Blowey, 2017, pp. 1-50; Georgescu & Anca, 2019, pp. 317-325):

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Table 1. (Flynn, Kaelber, Baker-Smith & Blowey, Clinical Practice Guideline for Screening and Management of High Blood Pressure in Children and Adolescents, p. 7, Volume 140, number 3, September 2017)

Children aged 1-13 years	Children > 13 years of age
Normal BP: <90 th percentile	Normal BP: <120/<80 mmHg
Increased BP: \geq 90 th percentile, up to < 95 th percentile or 120/80 mmHg to < 95 th percentile (lower value considered)	Increased BP: 120/<80 mmHg to 129/<80 mmHg
Stage I HTN: \geq 95 th percentile to < 95 th percentile + 12mmHg, or 130/80mmHg up to 139/89 mmHg (lower value considered)	Stage I HTN: 130/80 mmHg to 139/89 mmHg
Stage II HTN: \geq 95 th percentile + 12 mmHg, or \geq 140/90 mmHg (lower value considered)	stage II HTN: >140/90 mmHg

Etiologically, arterial HTN in children has a secondary cause more frequently, and cases of essential HTN (primary) are rarer. Thus, the secondary causes of arterial HTN are: obesity, renal causes (Chronic glomerulonephritis, pyelonephritis, acute renal failure, kidney malformations, obstructive uropathy, renal artery stenosis, renal artery thrombosis), endocrinological causes (hyperthyroidism, Cushing syndrome, primary hyperaldosteronism, congenital hyperplasia of the adrenal glands), central nervous system causes (Intracranial hypertension), cardiovascular causes (Aorta coarctation, Takayasu arteritis), tumor (Feochromocytoma, Wilms Tumor) (Flynn, Kaelber, Baker-Smith & Blowey, 2017, pp. 1-50; Georgescu & Anca, 2019, pp. 317-325).

The most frequent clinical signs associated with a rise of the blood pressure values are: Headache, Epistaxis, Lipotimia, and as far as risk factors are concerned, the most prevalent and the most important are: sedentarysm, obesity, addictive behaviours, unhealthy eating habits, heredocolateral history which are the leading risk factors for developing cardiovascular diseases (Georgescu & Anca, 2019, pp. 317-325; Xiaoli Liu et al., 2017, pp. 1-6).

Treatment

Nonpharmacological (Flynn, Kaelber, Baker-Smith & Blowey, 2017, pp. 1-50; Georgescu & Anca, 2019, pp. 317-325; Lurbe, et al, 2016, pp. 1888-1913)

- reducing the sodium intake from the diet, causes a decrease in both BP and cardiovascular risk and implicit mortality; a similar effect is also the consumption of olive oil (with polyphenol content);
- balanced nutrition consisting of fresh fruits and vegetables, whole grains, skimmed milk, lean meat (fish, chicken, lean red meat), oilseeds (nuts)
- limited sugar intake
- adherence to the mentioned dietary measures is associated with decreased BP values and cardiovascular risk in both childhood and young adulthood.
- sustained physical activity, decreases BP values; studies show that physical activity 3-5 days a week led to a decrease in BP values by up to 6.6mmHg
- reducing stress factors.

Pharmacological (Georgescu & Anca, 2019, pp. 317-325; Lurbe, et al, 2016, pp. 1888-1913; Samuels, 2015, pp. 1-7)

- initially monotherapy with the lowest effective dose is recommended in cases of symptomatic HTN, stage 2 HTN, or arterial HTN associated with chronic kidney disease, or with diabetes mellitus (usually ACE inhibitors or ARB);
- if monotherapy does not control satisfactory HTA, double therapy, frequently preferring the association of a thiazid diuretic;

ACE inhibitors= of election in initiating HTN therapy;

- may be used as an initial therapy and sartans/ calcium channel blockers/ thiazid diuretics
- beta blockers are not recommended as the first line of antihypertensive treatment in children, as they have not been associated with significant improvements in adults.
- in the case of non-responsive HTN to 2 or more pharmacological agents, treatment with alpha-blockers, beta-blockers, potassium-saving diuretics is used.

Material and Method

In the current epidemiological context, we studied patients admitted to the cardiology service of the Children's Emergency Clinical Hospital "St. John" in Galati between 01.03.2020-01.03.2021, following them from the perspective of the reasons for the admission, variations in blood pressure, demographic indicators.

The method of assessing blood pressure was represented by Holter devices, using appropriate cuffs to avoid the risk of getting falsely modified results.

Results

Of the 16 patients aged 11 to 18 years admitted to the cardiology service of the "Sf. Ioan" Children Clinical Emergency Hospital in Galati, 56% were male patients.

The most hospital admissions were between March 2020 and August 2020, 44% of them in March 2020-May 2020, and 31% in June-August 2020 respectively.

Restrictive measures imposed in the context of the COVID-19 pandemic, i.e. home isolation and permission to leave the home only on the basis of a declaration on their own responsibility within certain time intervals, have coincided with an increase in the number of admissions in the period during which these measures were applied.

The main blood pressure variations revealed by this study were "white-coat" hypertension (29%), newly diagnosed arterial hypertension (30%), hypertensive spills, the latter being found in the highest proportion among studied patients (41%).

In most cases the length of hospitalization exceeded 4 days, during which patients were evaluated clinically, paraclinically, but also psychologically advised, thus highlighting the anxious component, which often interferes with blood pressure values. 63% of the patients were hospitalized between 4-7 days, and 37% were hospitalized for 1-3 days.

The most common clinical manifestation that led to the presentation at the hospital was headache-present in 25% of the studied patients, frequently associated with vertigo (18% of the cases), and HTN at the emergency ward (21% of the cases), unrelated to any demanding activities, but largely due to restrictive measures imposed and the switching to online school.

Sinus tachycardia accompanied most of the symptoms of patients at admission (71% of the cases), which was subsequently spontaneously remitted, without the need to initiate pharmacological treatment in this regard.

Since the beginning of the COVID-19 pandemic, of patients diagnosed with variations in BP, only one case of associated left ventricular hypertrophy has been discovered. 53% of patients diagnosed with high BP values were obese, and 11% exhibited anxious behavior.

Conclusions

The COVID-19 pandemic is an unprecedented situation that pediatric patients feel acutely, the proof of it being the numerous presentations at the hospital for subjective manifestations correlated with restrictive measures imposed on the entire population.

Aknowledgements

“This work is supported by the project *ANTREPRENORDOC*, in the framework of Human Resources Development Operational Programme 2014-2020, financed from the European Social Fund under the contract number 36355/23.05.2019 HRD OP /380/6/13 – SMIS Code: 123847.”

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